Potato Progress

Research and Extension for Washington's Potato Industry
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Washington State Potato Commission

Final Research Review, February 18-19, 2009
Best Western Hotel, Pasco

Purpose: Hear results from 2008 potato commission research projects and listen to proposals for 2009 research
Who's Welcome: All Washington potato growers and other potato industry members
Location: Best Western Hotel, Pasco, near the airport
Phone: 509-543-7722. Mention the WSPC when making your reservation and you will get the rate of $92.95
Time: February 18, 8:00 am – 5:30 pm; February 19, 8:00 am – 1:00 pm

Pesticide Re-certification Credits: Will be available both days. RSVP appreciated for meal planning purposes to Andy Jensen, ajensen@potatoes.com or 509-765-8845.

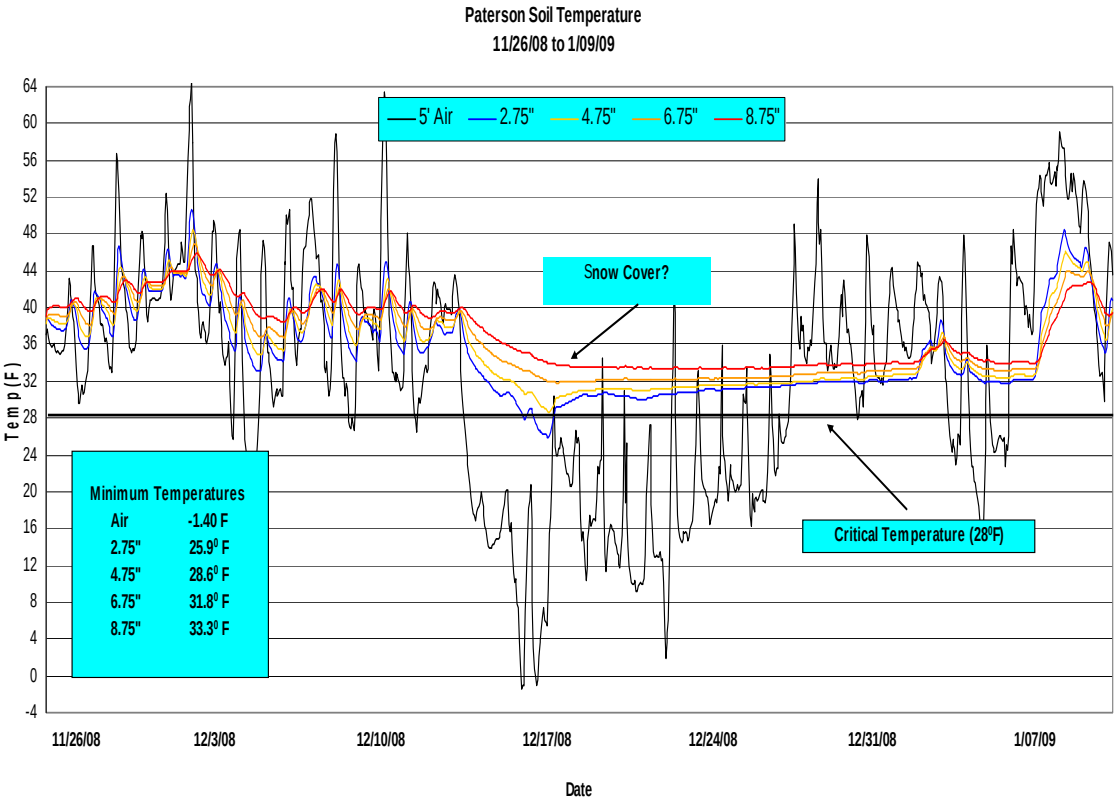
Volunteer Potato Outlook

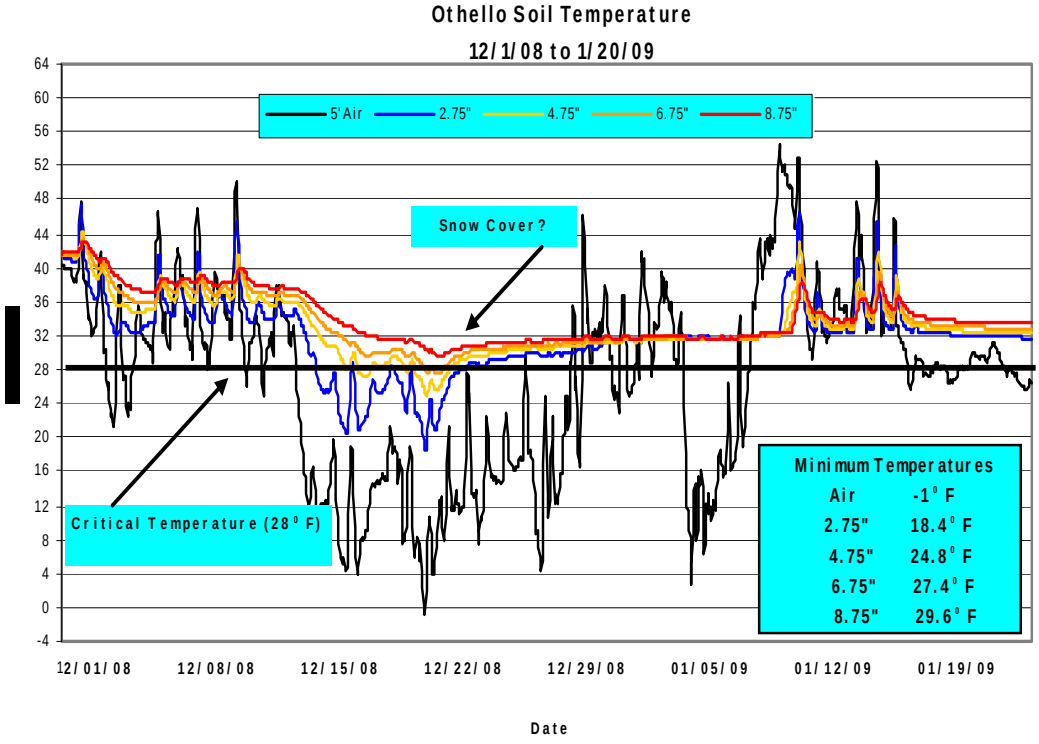
Rick Boydston and Marc Seymour, USDA-ARS, Prosser.

Winter soil temperatures recorded at the USDA-ARS research site near Paterson, WA indicate that soil temperatures of 26^0 F on December 16 killed tubers above 3 inches deep. During the period December 14-22 soil temperatures at Othello were low enough to kill tubers above 7 inches deep. Potato tubers are normally killed when they reach temperatures ≤ 28° F. Cold air temperatures prevailed in the Basin from December 14-26, but snow fall around December 17 at Paterson and December 22 at Othello prevented killing temperatures from progressing deeper and increasing tuber mortality. Data from the Agrimet weather station in Odessa, WA indicated that lowest soil temperatures occurred on December 20 and tubers above 7 inches deep likely froze depending on local snow cover.

If these data are representative of local fields, growers in the south Columbia Basin will likely have significant volunteer potato problems in 2009. Volunteer potatoes in the Othello area and further north in the Columbia Basin likely experienced killing temperatures at deeper depths and those potatoes that do emerge in the spring should be from lower depths and somewhat delayed.

For more information on volunteer potato control visit the Prosser USDA-ARS website at; http://www.ars.usda.gov/main/site_main.htm?modecode=53-54-00-00

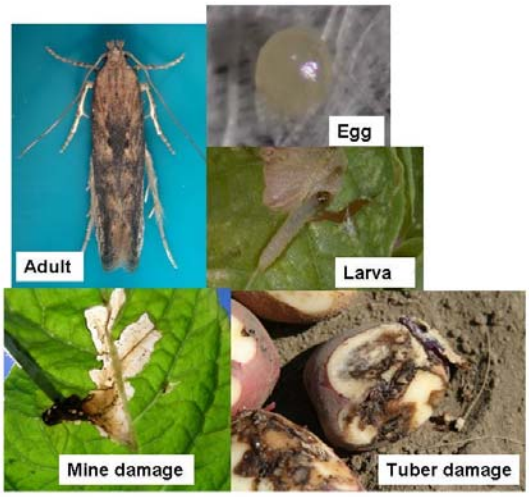

Paterson Soil Temperature
11/26/08 to 1/09/09
5' Air
2.75"
4.75"
6.75"
8.75"
Snow Cover?
Critical Temperature (28°F)
Minimum Temperatures
Air -1.40 F
2.75" 25.9° F
4.75" 28.6° F
6.75" 31.8° F
8.75" 33.3° F
Temp (F)
Date
11/26/08
12/3/08
12/10/08
12/17/08
12/24/08
12/31/08
1/07/09


Othello Soil Temperature
12/1/08 to 1/20/09
5' Air
2.75"
4.75"
6.75"
8.75"
Snow Cover?
Critical Temperature (28° F)
Minimum Temperatures
Air -1° F
2.75" 18.4° F
4.75" 24.8° F
6.75" 27.4° F
8.75" 29.6° F
Date
12/01/08
12/08/08
12/15/08
12/22/08
12/29/08
01/05/09
01/12/09
01/19/09

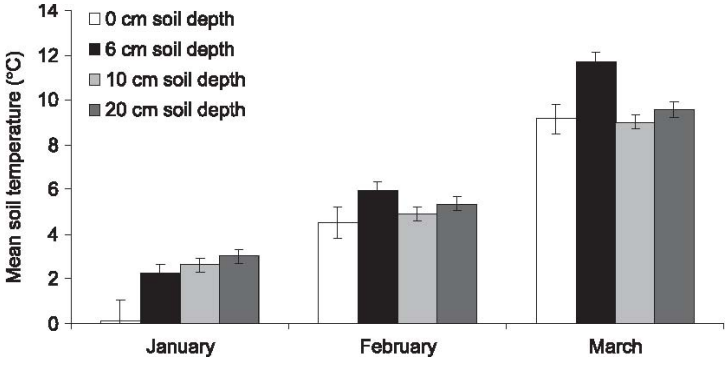
Exposure to winter conditions on survival of the potato tuberworm

Silvia I. Rondon
Oregon State University, Hermiston Agricultural Research and Extension Center,
Crop and Soil Science, Hermiston, OR 97838

Potato tuberworm is one of the most important and widely distributed insect pests of cultivated potato. Females lay eggs on foliage, exposed tubers, and the soil surface near the plant; larvae cause damage by mining mesophyll layers in the leaves or by tunneling through tubers. Foliar damage does not usually result in significant yield losses; however, infested tubers have reduced marketability. As larval development nears completion, larvae leave foliage or tubers and seek sheltered areas for pupation, including in the upper layer of soil, in dead leaves, or under plant debris. Although potato tuberworm is distributed throughout the world, the pest is most commonly found in tropical and subtropical regions. In the USA, potato tuberworm was recorded in California as early as 1856. The first report of tuberworm in the Pacific Northwest occurred in 1913, when Chittenden (1913) reported its presence in Washington. No further evidence of tuber damage associated with potato tuberworm was found in the Pacific Northwest until 2002, when tuber damage caused by potato tuberworm was found in Oregon. The patterns of increased densities and range expansion suggest that this population of potato tuberworm is overwintering in the area, rather than re-colonizing or being re-introduced from more moderate latitude.



Tuberworm does not undergo diapause, a specialized programmed resting state used by many insects (e.g. Colorado potato beetle) to survive harsh weather. Little is known about the ability of potato tuberworm to survive the extreme temperatures associated with winter in regions such as in the Northwest of the USA. Mean winter temperatures in the Columbia Basin are typically near 0 °C, and thus the presence of potato tuberworm in the



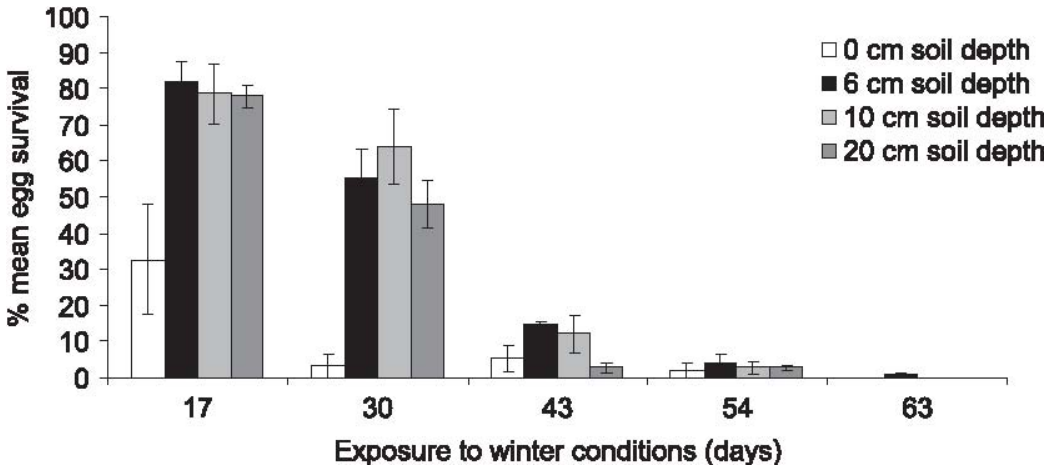
Mean (± SE) temperature at 0, 6, 10, and 20 cm soil depth in January, February, and March 2007, in Hermiston, OR, USA.

Columbia Basin is surprising. Temperature of soil, where eggs, larvae-infested tubers, and pupae are found in winter, varies at different depths, and may insulate these stages from the harsh ambient air temperatures. Late fall and early spring soil cultivation practices have the potential to further distribute potato tuberworm to different soil depths, including inactive stages such as eggs and pupae. Therefore, the objectives of this study were to determine the potential of potato tuberworm to survive winter conditions at different soil depths and to determine whether certain developmental stages are more vulnerable to winter conditions than others.

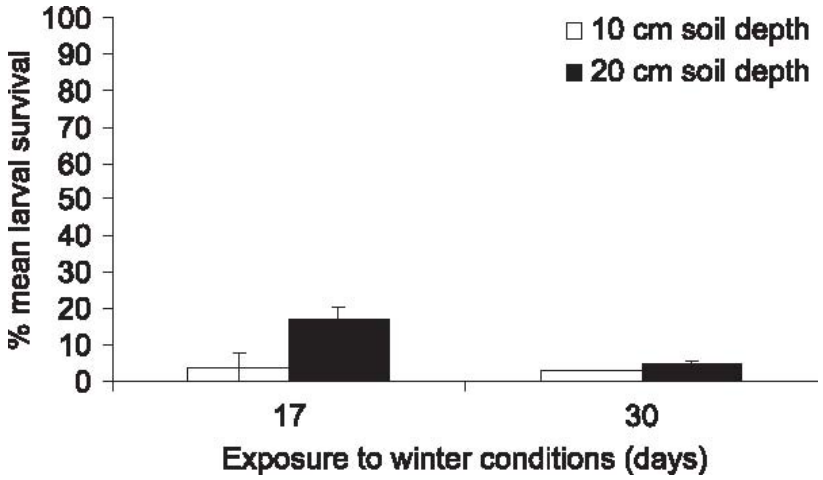
What have we learned?

Soil temperatures. In January, temperature at the surface was 0^{o}C and was significantly lower compared to temperatures at 6, 10 and 20 cm soil depths. In February, soil temperature at different depths were not significantly different.

Egg survivorship. Egg survival across all soil depths (0, 6, 10, 20 cm) was 67.8% after 17 days. As time progressed, egg survival gradually declined and no eggs survived after 63 days. Eggs on the soil surface (0 cm soil depth) had consistently lower survival rates as compared to eggs buried at 6, 10, 20 cm depth. Also, as time progressed, egg survival at the soil surface decreased more rapidly compared to eggs buried at 6-20 cm depths.

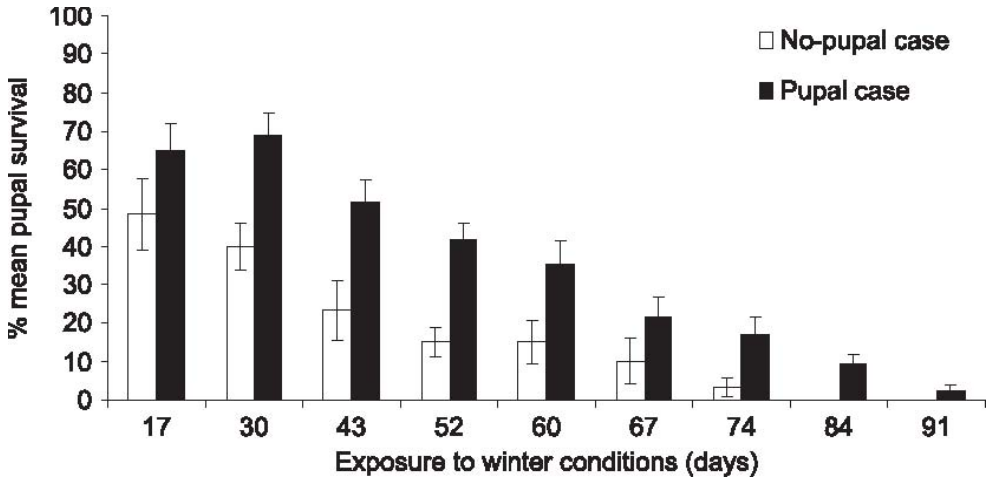


Larval survivorship. Larval survival averaged across all soil depths was only 5.2% after 17 days and no larvae survived after 30 days of being exposed to winter conditions. Only larvae in tubers buried at 10 and 20 cm survived; tubers at surface and at 6 cm depth were completely frozen and thus larvae inside tubers were killed. Soil depth provided protection for larvae for a short period of time, but as time progressed, larvae did not survive.



Pupal survivorship. Building pupal cases may be a key characteristic in imparting greater survival ability for pupae under extreme winter conditions. After 30 days, approximately 60% of pupae with cases and 40% of pupae without cases survived. Pupae without a pupal case did not survive after 74 days, while pupae with cases survived more than 91 days. Some pupae survived through the entire duration of the experiment. Length of exposure had a significant effect on pupal survival which gradually decreased with increasing exposure to winter conditions. Time and presence of case was significant, as was the interaction between length of time and soil depth.

Left, pupae with pupal case; right, pupae without pupal case



Conclusions

- Potato tuberworm populations have the potential to survive winter conditions in the Columbia Basin
- Survival is more likely to occur in the pupal stage.
- Pupae are able to survive more than 90 days of exposure to cold temperatures in the soil. Larvae and eggs remain in the tubers; thus since larvae, eggs and pre-pupal stages remain inside tubers, they are more likely to be killed by frost.
- Results of this study suggest the importance of the pupal stage in surviving in the Columbia basin.
- This study also provides evidence that pupal cases may be a key characteristic in imparting greater winter survival ability for pupae.

The survival of potato tuberworm in the Columbia Basin poses a significant economic threat to potato production in the region. One major abiotic factor affecting the likelihood that potato tuberworm will cause high levels of damage in the following growing season may be winter conditions. However, the success of potato tuberworm as an economically significant pest depends not only upon its ability to survive winter temperatures, but also to locate food in late winter and early spring

Information from:
Dogramaci, M., **S.I. Rondon**, S.J. DeBano. 2008. The effect of soil depth and exposure to winter conditions on survival of the potato tuberworm *Phthorimaea operculella* (Lepidoptera: Gelechiidae). Entomol. Exp. Applicata 129: 332-339.

Dogramaci, M. Postdoctoral Associate, University of Florida; Rondon, SI. Assistant Professor, Oregon State University, Hermiston Ag. Res. and Ext. Center; DeBano, SJ. Assistant Professor, Oregon State University, Hermiston Ag. Res. and Ext. Center.

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